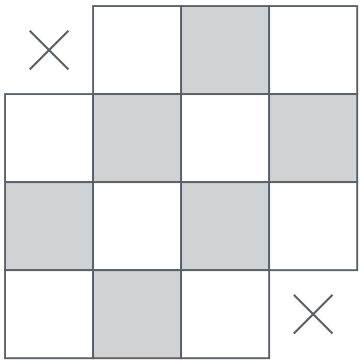
Small puzzles. Clearer thinking.

Six short challenges in logic, counting and probability. Take your time, write down a reason, then turn to page 4 for the solutions.

1 The missing corners

Can seven dominoes cover every remaining square of this 4 x 4 board?



X = removed square



One domino

Each domino covers two neighboring squares. You may rotate it. No overlaps, overhangs or gaps are allowed. The two marked corner squares are removed.

Possible or impossible? Explain:

2 One true label

Exactly one box contains a key. Exactly one of these three labels is true. Which box contains the key?

A

Key is in B.

B

Key is not in B.

C

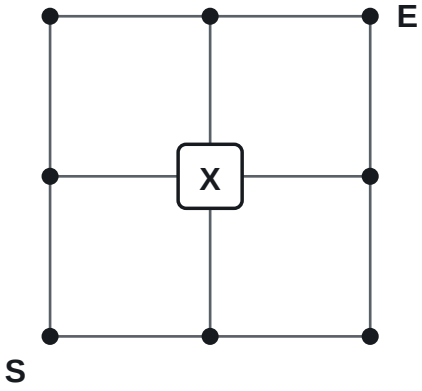
Key is not in A.

The key is in box:

My reason:

3 The blocked center

How many routes lead from S to E without visiting X?



Move only along the drawn lines, from one intersection to the next. Every move must go **RIGHT** or **UP**. No left, down or diagonal moves. The center intersection X is blocked.

Try naming each move:

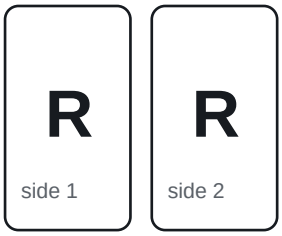
R = right U = up

Number of routes: How I know I found them all:

4 The other side

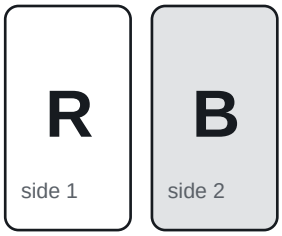
Three cards have these colors on their two sides. R means red and B means blue.

CARD 1



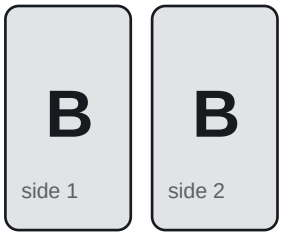
Two sides of one card

CARD 2



Two sides of one card

CARD 3



Two sides of one card

Choose one of the three cards with equal probability. Then choose either of that card's two sides with equal probability to face you. **You see red.** What is the probability that the reverse side is also red?

My probability and reason:

5 Flip a pair

Four arrows start pointing down. Can you finish with exactly one arrow pointing up?

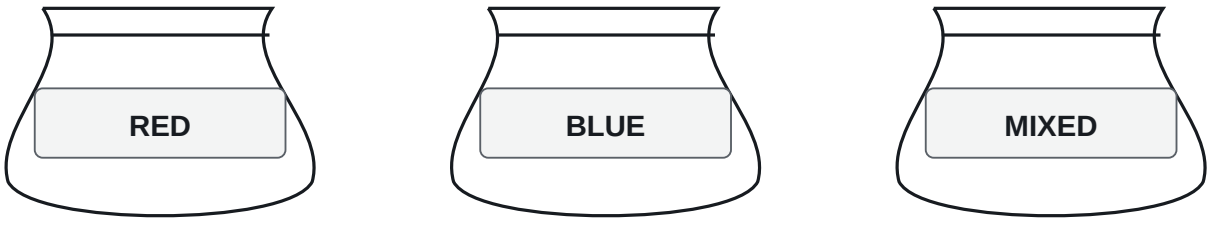


One move flips **exactly two distinct arrows**: up becomes down and down becomes up. You may choose any pair on each move, including a pair you have used before. Make any finite number of moves.

Possible or impossible? Explain:

6 Every label is wrong

One bag contains only red balls, one only blue balls, and one a mix with both colors present. Every label below is wrong.



Shown words are the current labels, not the actual contents.

Without looking inside, draw **one ball from one bag** and observe its color. Which labeled bag should you choose so that the result lets you identify all three bags with certainty? Explain both possible draw colors.

Choose the bag labeled: Why:

The useful part is the reason.

Compare the reasoning, not just the final answer.

1 Impossible.

Every domino covers one light square and one dark square. The two removed opposite corners have the same color, leaving 6 squares of one color and 8 of the other. Seven dominoes would need 7 of each. **Idea:** count a quantity that every allowed piece must balance.

2 The key is in A.

Labels A ("in B") and B ("not in B") are exact opposites: one of them is always true. That uses the single true label, so label C must be false. "Not in A" being false means the key is in A. Check: A is false, B is true, C is false. **Idea:** use a contradiction before testing every case.

3 Exactly 2 routes.

A route starts either right or up. If it starts right, the next step must also go right: turning up reaches X. The remaining two up steps are forced, giving RRUU. Starting up similarly forces UURR. There are no other first moves. **Idea:** split the possibilities into complete, non-overlapping cases.

4 The probability is 2/3.

The random card and random facing side create six equally likely card-side outcomes. Seeing red leaves three: the first red side of RR, the second red side of RR, and the red side of RB. Two of those three have a red reverse. **Idea:** count equally likely outcomes, not merely the cards that remain.

5 Impossible.

Flipping two down arrows adds 2 to the up-count. Flipping one up and one down changes it by 0. Flipping two up arrows subtracts 2. The count starts at 0 and stays even, so it cannot become 1. **Idea:** an invariant - here, evenness - can rule out a target without searching for moves.

6 Draw from MIXED.

Its label is wrong, so it contains only one color. If the draw is red: MIXED is red-only; BLUE cannot be blue-only or the already assigned red-only, so BLUE is mixed and RED is blue-only. If the draw is blue: MIXED is blue-only; RED is mixed and BLUE is red-only. **Idea:** choose the observation that removes uncertainty in either case.

Classic puzzle ideas; diagrams and explanations by Oddly Clear Lab. No claim of inventing the underlying puzzles.